PATENT COOPERATION TREATY

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From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

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NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing *(day/month/year)*	11. 11.98
Applicant's or agent's file reference ---	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/BR98/00053	28/07/1998	29/07/1997

Applicant
MARTINEZ. Celso. Jr.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/	Authorized officer
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Form PCT/IPEA/416 (July 1992)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/BR98/00053	28/07/1998	29/07/1997
International Patent Classification (IPC) or national classification and IPC		
E04D11/02		
Applicant		
MARTINEZ, Celso, Jr.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 8 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
18/02/1999	11.11.99
Name and mailing address of the international preliminary examining authority:	Authorized officer
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Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/BR98/00053

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-6	as received on	29/06/1999	with letter of	24/06/1999

Claims, No.:

1-3	as received on	29/06/1999	with letter of	24/06/1999

Drawings, sheets:

1/1	as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims 1-3
	No:	Claims
Inventive step (IS)	Yes:	Claims 1-3
	No:	Claims
Industrial applicability (IA)	Yes:	Claims 1-3
	No:	Claims

2. Citations and explanations

see separate sheet

Re Item I

Basis of the opinion

1 The amendments filed with the letter dated 29.06.1999 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT.

1.1 The amendments concerned are the following: Newly filed claim 1 (see lines 6, 7, 9, 11) contains other features than those in the original claim 1:

a) - surfaces (1) smoothed or not instead of
surfaces (1) mud slap regularized or not

b) - surfaces (1) lack surfaces (1) of concrete, wood, metal etc.

c) - piping (3) lacks pipeline (3) in PVC or other equivalent material

d) - viscous-plastic resin (4) instead of
viscoelastic resin (4)

e) - resin (4) lacks selfleveling resin (4)

f) - bolts/bushings/washers (6) instead of
screws/plastic washers/expansion shells groups (6)

1.2 These alternative features imply a broadening and/or a change in protection of the claim. There is no basis in the application for these changes. The applicants argument dated 16.10.1999 cannot be agreed on:

1.2.1 The points a,b,c represent broadenings; f a simple change.

1.2.2 Points d & e: The original word *viscoelastic* implies an ableness to exhibit both viscous and elastic behaviour, in an intermediate state between plastic and elastic behaviour. The missing word self-levelling also helps to indicate these features.

1.3 Claim 2 discloses "relative displacements" in lines 19-20 whereas the original description mentions "small sliding" and "small structural movements", see page 4, line 14 and page 5, lines 9 -10, respectively. There is also no basis for the resin being "viscous-plastic" in line 19.

1.4 Therefore, the complete set of newly file claims 1 to 3 is in conflict with Article 34(2)(b) PCT.

1.5 This comment also applies for parts of the description, see e.g. page 3, line 13:

- ca. 35 micra instead of about 35-50 micrometers

2 The following statements with regard to Article 33 PCT have been established on the new claims as if the above underlined amendments had not been made (Rule 70.2(c) PCT).

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

3 Reference is made to the following documents:

D1: WO-A-97 03258
D2: US-A-4 473 610

4 The invention concerns protection for exposed building roofs against the percolation of water by applying an organic resin protected by a composite of aluminium alloy with thermoplastic copolymers according to the preamble of claim 1.

5 The subject-matter of claim 1 is new and inventive for the following reasons (Articles 33(2)&(3) PCT):

The problem to provide a watertight roofing is solved according to claim 1, in which the protection is achieved thanks to two processes: 1) application of a viscoelastic resin over a surface and 2) covering by strips of composite made of coated aluminium alloy.

5.1 Coated metal sheets for outdoor building materials are rather conventional, the abstract and claims 1 and 2 of document D1 disclose a multi-layer aluminium composite comprising an aluminium foil carrying a polymer surface coating. However, this composite is destined to explicitly to siding and not to roofing application.

5.2 Document D2 shows in figure 1 the fastening of an aluminium foil (17) to a wooden board (13) by resin (15) with the effect of flexibility in cold and hot weather and no cracking (see D2 column 1, lines 10-17), i.e with the same advantages as mentioned in the present application. But, this document lacks to specify the engineering properties.

Hence, there is no indication for the skilled man to combine these documents, and further a combination would not lead to the full invention. The requirements of Articles 33(2)&(3) are therefore fulfilled, the subject-matter of claim 1 is new and based on an inventive step.

5.3 The industrial applicability is also given (Article 33(4) PCT).

6 The claims 2 and 3 concern further advantageous developments of the protection according to claim 1. They are new, inventive and industrial applicable (Article 33 PCT).

Protection for exposed building roofs against the percolation of water, by application of an organic resin protected by a composite of an aluminium alloy lined with thermoplastic copolymers.

The present Utility Model relates to a technique for protection of exposed building roofs, comprised of cementitious structures or not, against the percolation of water, that combines in a single system two processes providing watertightness to the substrate, thereby providing a higher degree of reliability to the surfaces treated through this method, against the infiltration of water.

The prefabricated systems currently intended to provide watertightness to roofs, excluding the conventional ceramic tile, fibre cement or metallic roofs, comprise mainly a prefabricated impermeable sheet of asphalt, asphalt-elastomeric or purely elastomeric base.

The asphalt and asphalt-elastomeric prefabricated sheets are usually reinforced internally with polyethylene films, polyester non-woven geotextiles or fiberglass non-woven textiles. The purely elastomeric sheets, particularly those molded on the site, usually do not present a reinforcement therein, even though some prefabricated polymer sheets are provided with reinforcement to provide additional tensile strength and perforation resistance. These materials are applied on a structural substrate (for example, concrete slabs), usually smoothed by a cementitious mortar, which is intended to provide a surface free of angular points and depressions, in addition to providing a proper slope for water flow.

Some of these materials are firmly adhered to the substrate by previous application of an appropriate asphalt primer. The primer is cold-applied, but the film attachment to the primer is most of the times hot-applied, by

utilization of LPG (liquid petroleum gas) torches.

Most of the systems having these characteristics receives a mechanical protection layer, usually made of a cement and sand mortar over the asphalt or elastomeric sheet, with interposition therebetween of an insulation known as "separating layer"; in these cases, these are roofs subject to the permanent transit of people or vehicles. In addition to preventing damage of mechanical nature to the watertight lining, such protection is intended to protect the sheet from the deleterious action of ultraviolet light.

However, there are self-protected, prefabricated asphalt or asphalt-elastomeric sheets intended to roofing for appropriate purposes. No protection mortar is applied over these sheets. They are provided on one of the faces thereof with some element intended to prevent the action of ultraviolet light on the asphalt material. Usually, this element comprises an appropriate elastomer (U.S. Patent 4,775,567), crushed slate dust, or a thin aluminium lining applied on one of the surfaces of the prefabricated asphalt sheet. These prefabricated sheets are intended for use on roofs having an eventual or sporadic transit, usually required for maintenance or cleaning operations thereof. Such linings do not provide mechanical protection to the sheets, but protect them against the solar rays, significantly contributing to protect them against the degrading action of ultraviolet light. On the other hand, the infrared light is also reflected by the lining, where the latter is made of aluminium, which improves the thermal comfort conditions of the environment protected by said system.

There are also prefabricated asphalt-elastomeric sheets wherein one of the faces thereof is provided with a self-adhesive finish and the other faces is provided with a thin aluminium foil, as in the previous case (U.S. Patents

4,936,938; U.S. 5,096,759 and U.S. 5,142,837).

Such material finds various applications in the Civil Construction segment, one of them being the repair of metallic roofs presenting infiltration caused by perforation of the tiles by oxidation. In this case, the primers are not employed, since one of the faces of the material is already provided with an adhesive element, and in order to promote the adhesion, it suffices that the substrate is properly clean and dry.

The main drawback in the case of aluminized sheets, lies on the low mechanical strength of the lining on the upper (exposed) face. Since the aluminium foil is extremely thin (ca. 35 micra), it is subject to mechanical action that may damage it, thereby exposing the asphalt portion of the sheet to the action of ultraviolet light.

Another quite common event in the application of alphalt or elastomeric sheets on building roofs is the difficulty in locating eventual defects causing loss of watertightness. The infiltration may be caused by a fault in the lateral or longitudinal welding between the sheets strips or even by involuntary perforation thereof. The liquid penetrates through the fault and travels by percolating inside the porous matrix of the smoothing layer, if any, until it finds a defect in the cementitious substrate, immediately below the smoothing layer (a fissure, concrete gap, etc.), through which the infiltration will become visible inside the building. In most of the cases, this visible point does not coincide with the position of the defect that has caused it. In addition, since the primer firmly and closely adheres the sheets to the substrate, in the event of occurrence of a dynamic fissure in the structure, caused by structural movement (for example, high weather thermal gradients), the new fault will propagate

itself to the roofing material. This intimate adhesion between the conventional sheets and the substrate does not allow a relative displacement therebetween. Accordingly, new dynamic cracks or fissures appearing on the substrate will propagate to the sheet in an extremely restricted region (in a line along the fissure) and, as a result, will cause the rupture thereof, since the specific deformation on this line will have a very high modulus, beyond the material's ability of absorbing it, and will crack the latter, thereby allowing the penetration of water through this crack.

The system developed, subject matter of the present Utility Model, solves such drawbacks, in addition to providing other advantages arising out of the conception thereof, through which the substrate's watertightness is generated by two processes: first, an organic composition resin is applied directly over the substrate structure to be treated, thereby sealing the pores on the surface thereof (it the event that it is porous); second, a composite comprised of an aluminium alloy lined with thermoplastic copolymers is adhered to the surface of the organic resin. Such system will be best understood through a description of the figures, which represent, in an schematic manner:

FIGURE 1 - plan of a surface to which the system in question has been applied.

FIGURE 2 - longitudinal cross-section of a surface to which the system in question has been applied.

FIGURE 3 - transversal cross-section of a surface to which the system in question has been applied.

With reference to these figures, it can be observed that the organic resin (4) is applied on the deck structure (1) and its baseboards or parapets (2). This viscous-plastic resin (4) has a high adhesion power to porous and non-porous substrates, in addition to being thermoplastic and

hydrophobic; in the specific case of porous substrates, the material adheres to the respective surface, penetrating the outer capillaries of this porous matrix and sealing them. Accordingly, said material renders the porous surface entirely watertight, by means of viscous-plastic blocking of its porosity.

On the substrate previously treated with said resin, a composite (5) comprised of an aluminium alloy lined on both faces with thermoplastic copolymers is applied so as to protect the resin from the deleterious action of ultraviolet light. The welding (7) of the several strips of this material in the longitudinal or transversal direction, is done by application of hot air, by means of appropriate equipment and temperature, at the overlapping interface of two strips of said material. The copolymer lining the aluminium alloy is thermoplastic and can be melted with hot air, adhering the adjacent sheets by means of the overlapping band. No adhesion material is required for this purpose.

In addition, due to the fact that the resin is viscous-plastic, it allows relative displacements between the composite and the substrate, so that eventual cracks or fissures occurring in this substrate by reason of deformations of thermal or mechanical nature will not propagate with the same intensity to the lining in question. In this case, the relative displacement effect provides that the deformations caused by fissures are absorbed by a large strip of the composite material. Accordingly, the specific deformation of the lining in this region will be very small, perfectly bearable thereby, and will be absorbed without rupture, ensuring a permanent watertightness.

The fact that the watertightness is generated by two distinct processes increases the reliability of this method, since in the event of a mechanical action causing a

perforation in the lining composite, even then the structure will remain watertight, since the pores thereof have been sealed by action of the organic resin.

For a better attachment of the ends of the composite strips to the substrate, bolts (6) provided with plastic washers are employed, attached to ordinary bushings introduced in appropriate orifices for this purpose, and made on the structure of the baseboard and parapets (2).

The water collected on the treated surface flows through a weldable PVC rainwater piping (3) or other material intended for that purpose.

The present model presents the following advantages:

a) a great resistance to involuntary mechanical action on the lining, achieved by the thickness of the composite employed (ca. 300 micrometers);

b) the fact that the system can be directly applied on the deck structure, dispensing with the smoothing layer, usually employed in the current systems, which makes it more economically feasible;

c) the fact that the system can be applied also on smoothed substrates, even though the preference is for direct application on said structure; and

d) ease and economy in the location of the event generating an eventual infiltration, at the time of performance of watertightness test, if the proposed system is applied directly on the structure.

CLAIMS

1.- Protection for exposed building roofs against the percolation of water, by application of an organic resin protected by a composite of an aluminium alloy lined with thermoplastic copolymers, for application over porous or non-porous exposed surface (1), smoothed or not, including baseboards or parapets (2) attached to the vertical surfaces of the structures by sets of bolts/bushings/washers (6), allowing the rainwater flow by means of a piping (3), characterized in that it is comprised of a highly adhesive, viscous-plastic, thermoplastic and hydrophobic organic resin (4) covered by strips of composite (5) made of aluminium alloy lined by thermoplastic copolymers, welded at the overlapping thereof (7) by means of a thermal process.

2.- Protection for exposed building roofs against the percolation of water, by application of an organic resin protected by a composite of an aluminium alloy lined with thermoplastic copolymers, as claimed on 1, characterized in that the resin (4), by being viscous-plastic, allows relative displacementes between the composite and the substrate, so that eventual cracks or fissures occurring in that substrate, caused by deformation of thermal or mechanical nature do not propagate to the lining in question with the same intensity, thereby ensuring a permanent watertightness.

3.- Protection for exposed building roofs against the percolation of water, by application of an organic resin protected by a composite of an aluminium alloy lined with thermoplastic copolymers, as claimed in 1 and 2, characterized in that the watertightness is generated by two distinct processes that in the event of a severe mechanical action causes a perforation of the composite lining, provide a permanent watertightness, due to the action of the resin, that seals the structure surface pores.

AMENDED SHEET

ABSTRACT

Protection for exposed building roofs against the percolation of water, by application of an organic resin protected by a composite of an aluminium alloy lined with thermoplastic copolymers.

The present Utility Model refers to a technique for protection of exposed roofs which in a single system conjugates two processes to generate watertightness for exposed substracts, cementitious or not, providing a better reliability to the treated surfaces against water infiltration, by means of this system.

Said System comprises the application on porous or non-porous exposed surfaces (1), smoothed or not, including the corresponding baseboards or parapets (2), of a highly adhesive organic resin (4), characterized in that it is viscous-plastic, thermoplastic and hydrophobic, covered by composite strips (5) of an aluminium alloy lined with thermoplastic copolymers, welded at the overlapping (7) thereof by means of a thermal process, attached to the vertical surfaces of the structures by sets of bolts/bushings/washers (6) and wherein the water discharge takes place by means of a rainwater drainage piping (3).